FACT SHEET FOR NPDES PERMIT
NO. WA-002016-8

CITY OF ZILLAH
PUBLICLY OWNED TREATMENT WORKS

DATE OF THIS FACT SHEET – SEPTEMBER 5, 2006
DATE OF EXPIRING PERMIT - OCTOBER 31, 2011

SUMMARY

The wastewater treatment plant for the City of Zillah consists of an oxidation ditch with secondary clarification, ultraviolet disinfection, aerobic digestion of sludge, and sludge dewatering equipment. The plant was originally constructed in the 1950's and has had many upgrades.

At this time, the treatment plant in undergoing another upgrade. A contractor has been selected and construction is expected to begin June 2006. The upgrade will improve solids handling and increase the capacity of the plant to 0.49 MGD average monthly flow. The upgrade is expected to be complete by June 2007.

This permit requires compliance with federal technology-based secondary treatment standards for BOD, TSS, pH, and fecal coliform.

In addition to routine monitoring, this permit requires a pretreatment sewer use ordinance, an updated Operations and Maintenance manual, an infiltration and inflow evaluation, and an outfall evaluation.

TABLE OF CONTENTS

INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Zillah
Facility Name and Address	City of Zillah Publicly Owned Treatment Works
Type of Treatment	Oxidation Ditch, Secondary Clarification, Ultraviolet Disinfection
Discharge Location	Yakima River Latitude: 46° 23' 57" N Longitude: 120° 15' 32" W
Water Body ID Number	WRIA 37-1020

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

The City of Zillah Publicly Owned Treatment Works (POTW) is located at the site of an early 1950's treatment plant. The land is leased from the State Department of Natural Resources. The plant was extensively upgraded in 1977 to include an extended oxidation ditch and sludge drying beds and an outfall under I-82 to the Yakima River at river mile 89.5 (City of Zillah 1998). Upgrades occurred again in 1993 and 1994 which included an additional secondary clarifier, aerobic digester, sludge dewatering equipment, ultraviolet disinfection system, and grit channels (City of Zillah 1998). The dewatered sludge is spread on city-owned land. The sludge drying beds are still used occasionally as well. Additional equipment added later to increase capacity and reliability included: new flow-meter, sampling equipment, oxidation ditch mixer, and 4 floating aerators.

The Zillah POTW is currently in the process of undergoing another major upgrade to increase plant capacity for city growth. The upgrade will address problem areas which include the difficult to maintain ultraviolet disinfection system and the bar screen and comminutor that are inadequate for removing large debris. The upgrade construction is expected to start June 2006 and be completed by June 2007. The improvements are listed below under "Treatment Processes." A schematic of the facility upgrade is included in Appendix E.

Figure 1. Vicinity Map for the City of Zillah (http://www.zillah.com/where_is_zillah.htm

Collection System Status

The sewage collection system includes lateral sewers and two trunk sewers running to the west and east that connect to a 12-inch gravity sewer main. A force main connects to the 10-inch east trunk sewer and carries sewage from two pump stations located in the eastern section of the city at Vintage Valley Road and off of Toppenish-Zillah Road. Both stations are near Interstate 82 Exit 52 (Gray & Osborne 2002).

A study of groundwater infiltration into the sewer system was conducted in 1999. The study determined that infiltration was 45,000 to 63,000 GPD, or up to 30 percent of the average annual wastewater flow (Gray & Osborne 2002). Based on EPA design standards, the study concluded that the infiltration was not significant at that time. However, infiltration was occurring at levels that require continued monitoring.

A 1999 study of storm-water inflow to the system was conducted for seven storm events in the period from May 1994 to January 1998. The study compared precipitation peaks to treatment plant influent flow data and concluded that inflow was not a problem at that time (Gray & Osborne 2002). An analysis of wet weather flow in the system was not performed.

The population served by the POTW and collection system is currently 2,595. The Zillah city limits include about 784 acres (City of Zillah 1998). An additional 444 acres of urban growth areas outside of current Zillah city limits have been identified. It is anticipated that some these urban growth areas will require sewer service in the future (Gray & Osborne 2002).

Treatment Processes

The POTW is a Class II facility. The principal operator is Class 2 certified by the State of Washington. In addition, the current Public Works director is a certified Class 2 operator. The POTW is staffed between the hours of 8 am to 5 pm, Monday through Friday.

Industrial land use occupies about 25 acres within the Zillah city limits and includes manufacturing, warehousing, transportation, communication, and utilities (City of Zillah 1998). Two apple and cherry fruit packing plants have been identified as Significant Industrial User (SIU) for discharge of cherry packing cooling water, hydro-cooling discharge, and packing line wastewater. Approximately 35 acres of land within the Zillah city limits had commercial use, according to the 1998 Comprehensive Plan (City of Zillah 1998). Commercial development includes stores, gas stations, offices, and restaurants.

The Zillah Wastewater Treatment Plant is currently undergoing an upgrade. In the 2002 facility plan, it was estimated that the upgrade will increase the design capacity from 313,000 gallons per day to 490,000 gallons per day (Gray & Osborne 2002). Improvements include:

- New mechanical fine screen equipment
- New aeration basin with diffusers
- New aeration basin blowers
- Oxidation ditch modifications including new rotor-aerators
- Modification of clarifier no. 2
- Rehabilitation of clarifier no. 1, including a complete mechanism replacement
- New UV disinfection system
- New effluent pumping system with 2 pumps
- New waste activated sludge pump
- Aerobic digestion system improvements, including new fine-bubble diffusers
- Electrical system improvements

When the upgrade is completed, screenings and grit will be removed by mechanical screening equipment prior to the existing influent Parshall flume. The influent will be combined with return activated sludge in the new aeration basin before entering the modified oxidation ditch. From the oxidation ditch, the wastewater will be routed to both modified secondary clarifiers. Excess clarifier sludge will be sent to the modified aerobic digesters. Effluent from the clarifiers will be disinfected by ultra violet lights before entering the effluent pump station, where it will flow by gravity to the river, except during high river flow conditions (Gray & Osborne 2006).

Discharge Outfall

Secondary treated and disinfected effluent is discharged from the facility via a 370-foot long pipe, which passes under Interstate 82 into the Yakima River at river mile 89.5. The outfall is a

submerged open-ended 10-inch diameter pipe located approximately two feet offshore and one foot below the low flow surface elevation.

Residual Solids

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the oxidation ditch, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum and screenings are drained and disposed of as solid waste at the local landfill. Waste sludge from the aerobic digester is dewatered with a drum thickener (or sludge drying beds during winter) and land applied on City property under the State General Biosolids Permit.

PERMIT STATUS

The previous permit for this facility was issued on July 10, 1996 and was reauthorized January 11, 2002. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, and Ammonia.

EFFLUENT LIMITATIONS: OUTFALL # 001			
Parameter	**Monthly Average**	**Weekly Average**	**Daily Maximum**
Biochemical Oxygen Demand (5-day)	30 mg/L: 78.3 lbs/day	45 mg/L; 117.5 lbs/day	N/A
Total Suspended Solids	30 mg/L: 78.3 lbs/day	45 mg/L; 117.5 lbs/day	N/A
Fecal Coliform Bacteria	200 Colonies/ 100 mL	400 Colonies/100 mL	N/A
Total Ammonia	N/A	N/A	6.9 mg/L
pH	Shall not be outside the range 6.0 to 9.0		

An application for permit renewal was submitted to the Department on February 28, 2006 and accepted by the Department on March 8, 2006.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on March 13, 2006. A compliance inspection and Laboratory Compliance Audit with sampling was conducted on February 23, 2005.

During the history of the previous permit, the Permittee has remained substantially in compliance, based on Discharge Monitoring Reports (DMRs) submitted to the Department and inspections conducted by the Department. Significant compliance problems that have occurred since the permit reauthorization are:

- On January 4, 2005, a high flow of approximately 600 gpm for 4 hours resulted in high total suspended solids (TSS) and a foam overflow. The high TSS resulted in a "Too Numerous To Count" fecal coliform reading.

- In July 2003, the fecal coliform levels exceeded maximum weekly average permit limits.

INFLUENT CHARACTERIZATION

Loadings to the POTW were reported in DMRs submitted to the Department and are compared with the applicable design criteria as follows:

Table 1: Influent Characterization

Parameter	3-year Characterization		Design Criteria
	3-year Average	Highest Monthly Average	Monthly Average for the Maximum Month (Pre-upgrade)
BOD_5, in lbs/day	521	723	700
TSS, in lbs/day	407	522	700
Flow MGD	0.223	0.249	0.313

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The effluent is characterized as follows:

Table 2: Effluent Characterization

	3-Year Characterization				Existing Permit Limits	
Parameter	3-Year Average	Highest Monthly Average	Highest Daily	Highest Weekly Average	Monthly Average	Weekly Average
BOD_5, in mg/L	7.98	16.2	29	N/A	30	45
TSS, in mg/L	10.2	24.0	36	N/A	30	45
Fecal Coliform Bacteria, in #colonies/100 mL	19.8	80.0		429	200	400
Ammonia, in mg/L	0.79		2.39	N/A	None	6.9 mg/L (Maximum Daily)

Although the BOD in the influent has been high, the facility's record of removing BOD and TSS has been excellent, with average monthly removals of 97 and 95%, respectively. The problems with fecal coliform levels are expected to be resolved with the installation of new ultraviolet disinfection equipment. Occasional plant upsets have occurred due to high flows from the fruit packing plants or periods of high suspended solids. Ammonia concentrations have not exceeded permit limits. Temperature and dissolved oxygen levels are not expected to exceed water quality standards with available dilution.

SEPA COMPLIANCE

A SEPA checklist was prepared for the POTW upgrade. The checklist addressed any impacts to the environment. The City of Zillah issued a Determination of Nonsignificance (Gray & Osborne 2002.)

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation**.** Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

The design criteria for this treatment facility are taken from the City of Zillah Wastewater Facility Plan (2002) engineering report prepared by Gray & Osborne, Inc. The design criteria used here are for the upgraded facility (in progress) and are as follows:

Table 3: Design Standards for 2021, Zillah POTW (Gray & Osborne 2002)

Parameter	Design Quantity
Monthly average flow (max. month)	0.49 MGD
Peak Hour Flow	1.01 MGD
Maximum Day Flow	0.74 MGD
Average Annual Flow	0.42 MGD
BOD_5 influent loading	1,064 lb./day
TSS influent loading	1,107 lb./day
Design population equivalent	4,220
TKN influent loading	213 lb./day, (52 mg/L)

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in Chapter 173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The following technology-based limits for pH, fecal coliform, BOD_5, and TSS are taken from Chapter 173-221 WAC are:

Table 4: Technology-based Limits

Parameter	**Limit**
pH	Shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL

Parameter	Limit
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). The interim limits are for before the upgrade in progress is complete.

Interim

Monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.313 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 78.3 lb./day.

Final (Upgrade Complete)

Monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.49 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 123 lb./day.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in receiving water while remaining protective of aquatic life. Numerical

criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

Numerical Criteria for the Protection of Human Health

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

Narrative Criteria

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the State of Washington.

Antidegradation

The State of Washington's Antidegradation Policy requires that discharges into receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if Yakima River ambient water quality, in the in the vicinity of Zillah, is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

Critical Conditions

Surface water quality-based limits are derived for the water body’s critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

Usable flow data from USGS flow gage stations in the Yakima River are available both upstream and downstream of Zillah, Washington. However, there are 2 large irrigation canal diversions after the upper station (Nob Hill) and Ahtanum Creek confluence with the Yakima River. These canals have maximum capacities of 2000 & 1300 cfs, respectively. The return flows from the diversions enter the river before the next flow station (Kiona). The irrigation canals are not always filled to capacity, but the highest flows occur from approximately June 20 to September 20. The Yakima River is managed intensively for irrigation, flooding, and fish passage and rearing by using storage basins (USDOI Bureau of Reclamation 2002; 2004). Peak river flow occurs from April to June.

The target low flows in the Yakima River below the diversions for July- September are 300 to 600 cfs depending on the total water supply available. During a drought year with insufficient storage, 300 cfs would be used (USDOI Bureau of Reclamation 2002). There is a gage station below the diversions at Parker, but the data, collected every 15 minutes are not summarized for use (http://www.usbr.gov/). During the summer of 2005, a drought year, the following flow ranges were measured at Parker for July through September: July, 290-600 cfs; August, 290-500 cfs; and, September, 280-440 cfs. Because of the lack of flow data, which are usable for analysis in the reach of the Yakima River in the vicinity of Zillah, 300 cfs flow is used as the 7Q10 low flow (the lowest seven-day average river flow with a recurrence of 10 years.)

Because of the high flow diverted for irrigation, the critical condition for the pollutants in this discharge is July through September.

Mixing Zones

This permit authorizes an acute and a chronic mixing zone around the point of discharge as allowed by Chapter 173-201A WAC, *Water Quality Standards for Surface Waters of the State of Washington*. The Water Quality Standards stipulate some criteria be met before a mixing zone is allowed. The requirements and Ecology's actions are summarized as follows:

1. The allowable size and location be established in a permit.

For this discharge, the percent volume restrictions of the Water Quality Standards resulted in a lower dilution factor than the distance and width restrictions. Therefore, the dilution factor calculated at the lowest seven-day average river flow with a recurrence interval of 10 years (7Q10) was used to determine reasonable potential to exceed water quality standards. A mixing zone study was prepared which determined dilution factors for the discharge utilizing the Department's standard RIVPLUME5 model (Fisher et al. 1979). The analysis is included in Appendix C. Based on highest monthly and daily critical period flows, the calculated chronic and acute dilution factors are 51.2 and 16.2, respectively.

2. Fully apply "all known available and reasonable methods of treatment" (AKART).

The technology-based limitations determined to be AKART are discussed in an earlier Section of this fact sheet.

3. Consider critical discharge condition.

The critical discharge condition is often pollutant-specific or water body-specific and is discussed above.

4. Supporting information clearly indicates the mixing zone would not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses, result in damage to the ecosystem or adversely affect public health.

The Department of Ecology has reviewed the information on the characteristics of the discharge, receiving water characteristics and the discharge location. Based on this information, Ecology believes this discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem or adversely affect public health.

5. Water quality criteria shall not be violated (exceeded) outside the boundary of a mixing zone.

A reasonable potential analysis, using procedures established by USEPA and the Department of Ecology, was conducted for each pollutant to assure there will be no violations of the water quality criteria outside the boundary of a mixing zone. Calculations are included in Appendix C.

6. The size of the mixing zone and the concentrations of the pollutants shall be minimized.

The size of the mixing zone (in the form of the dilution factor) has been minimized by the use of design criteria with low probability of occurrence. For example, the reasonable potential analysis used the expected 95^{th} percentile pollutant concentration, the 90^{th} percentile background concentration, the centerline dilution factor and the low flow occurring once in every 10 years. The concentrations of the pollutants in the mixing zone have been minimized by requiring pollution prevention measures where applicable.

7. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

8. Acute Mixing Zone.

A. Acute criteria met as near to the point of discharge as practicably attainable

The acute criteria have been determined to be met at 10% of the distance of the chronic mixing zone.

B. The concentration of, and duration and frequency of, exposure to the discharge, will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

The toxicity of pollutants is dependent upon the exposure which in turn is dependent upon the concentration and the time the organism is exposed to that concentration. For example EPA gives the acute criteria for copper as "freshwater aquatic organisms and their uses should not be affected unacceptably if the 1- hour average concentration (in µg/l) does not exceed the numerical value given by $(0.960)(e^{(0.9422[\ln(\text{hardness})] - 1.464)})$ more than once every three years on the average." The limited acute mixing zone authorized for this discharge will assure that it will not create a barrier to migration.

C. Comply with size restrictions.

The mixing zone authorized for this discharge meets the size restrictions of WAC 173-201A.

9. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Description of the Receiving Water

The facility discharges to the Yakima River which is designated as freshwater, Class A receiving water in the vicinity of the outfall. Other nearby point source outfalls are the Buena and Granger municipal treatment plant outfalls. Significant nearby non-point sources of pollutants include the Moxee and Granger irrigation drain regions. Characteristic uses include the following:

water supply (domestic, industrial, agricultural); stock watering; fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

Surface Water Quality Criteria

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Table 5. Applicable Water Quality Criteria

Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	21 degrees Celsius maximum or incremental increases above background: if above 21 ^{o}C no greater than 0.3 ^{o}C, and, if below 21 ^{o}C, not to exceed t=34/(T+9)
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

Sections of the Yakima River have been listed on the Department's 303(d) list of impaired water bodies because of violations of temperature, suspended sediments, fecal coliform, and pesticide concentrations. Total Maximum Daily Loads (TMDL's) have been established for the Moxee Drain and the Granger Drain, discharging to the Yakima River above and below Zillah, respectively. Contaminants identified are pesticides found in fish tissue at levels of concern for human health. Recently, dissolved oxygen has been measured at levels of concern in the lower Yakima River during critical periods.

Yakima River water quality sampling has not yet been performed in the vicinity of the Zillah POTW outfall.

Consideration of Surface Water Quality-Based Limits for Numeric Criteria

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls, which the Department has determined to be AKART.

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants--their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

Table 6: Ambient Data Used in Water Quality Modeling. **The critical condition for the Yakima River at Nob Hill Water Quality Station: Data for low (July-September) flow period from July 1995 through September 2005 (http://www.ecy.wa.gov/.)**

Parameter	Value used
7Q10 low flow	300 cfs
Velocity	0.50 ft/sec
Depth	3.0 feet
Width	200 feet
Roughness (Manning)	n=0.029
Temperature (90^{th} percentile critical period)	20.1^{o} C
pH (90^{th} percentile)	8.73
Dissolved Oxygen (10^{th} percentile)	9.4 mg/L
Total Ammonia-N (critical period average)	0.014 mg/L
Fecal Coliform	49.4/100 mL (dry weather)
Conductivity	87 umhos/cm
Turbidity	5.46 NTU

BOD_5--Under critical conditions there is no predicted violation of the dissolved oxygen criteria for the receiving water. The 10^{th} percentile ambient dissolved oxygen (DO) for critical conditions was 9.4 and the effluent 10^{th} percentile DO was 4.2. When considering dissolved oxygen with simple mixing, the resultant values at the edge of the chronic and acute mixing zones were 9.2 and 8.7, respectively (Appendix C.) Because these values exceed the water quality standard of 8.0 mg/L, the technology-based effluent limitation for BOD_5 was placed in the permit.

pH--The impact of pH was modeled using the calculations from EPA, 1988 (Appendix C.) The input variables were dilution factor 25.7, upstream temperature 20.1^{o}C, upstream pH 8.73, upstream alkalinity 81 mg/L (as mg $CaCO_3$/L; value from previous permit), effluent temperature 24^{o}C, effluent pH of 7.2 (average critical period), and effluent alkalinity 264 mg/L (as mg $CaCO_3$/L). The resulting pH value was 8.07. Under critical conditions there is no predicted violation of the Water Quality Standards for pH, and the technology-based effluent limitations for pH was placed in the permit.

Temperature—The 90^{th} percentile temperature at critical conditions used for receiving water and effluent were 20.1^{o}C and 24^{o}C, respectively. Because the receiving water temperature is less than 21^{o}C, the limiting temperature factor this Class A section of the Yakima River (from WAC

173-201A-130) is T=34/(T+9). The resulting temperature increase limit at the edge of the chronic mixing zone was calculated to be 1.17 ^{o}C (Appendix C).

Using the POTW flows for the past 3 years, a weighted average was used to calculate the river temperature increase due to the POTW discharge (Appendix C). The estimated temperature increase for maximum monthly and maximum daily flows are 0.12 and 0.16 ^{o}C respectively. These temperature increases are for worst-case conditions and are well below the allowable temperature increase limit of 1.17 ^{o}C. Therefore, no effluent limitation limit for temperature was placed in this permit.

Fecal coliform—Below Zillah, municipalities discharging to the Yakima River have been given a lower water quality-based fecal coliform limit due to high fecal coliform levels in the river. However, sampling has not occurred in the vicinity of Zillah. For the past 3 years, the Zillah POTW critical period average monthly fecal coliform levels ranged between 3 and 80 organisms per 100 ml, with an average of 22. These values are below the water quality standard of 100 organisms per 100 ml. Because under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters, the technology-based effluent limitation for fecal coliform bacteria was placed in this permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

Ammonia was determined to be present in the discharge. A reasonable potential analysis (See Appendix C) was conducted on this parameters to determine whether or not effluent limitations would be required in this permit. The determination of the reasonable potential for Ammonia to exceed the water quality criteria was evaluated with procedures given in EPA, 1991 (Appendix C) at the critical condition. The critical condition in this case occurs July through September. The parameters used in the critical condition modeling are as follows: acute dilution factor 16.2, chronic dilution factor 51.2, receiving water temperature 20.1 ^{o}C, ambient ammonia 0.014 mg/l, and effluent temperature 24^{o}C.

The maximum ammonia concentration measured in the effluent was not determined to have a reasonable potential to cause a violation of the Water Quality Standards.

Removal of Ammonia Limits – Anti-Backsliding Provisions:

Exceptions to anti-backsliding rules that apply (from 40CFR 122.44) include:

"*The Administrator determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under section 402 (a)(1)(b)*" (40CFR 122.44(1)(B)(2). Errors appear to have been made in calculating dilution factors for the previous permit.

"Information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance" (40CFR 122.44(1)(B)(1). The last three years of POTW data do not contain ammonia concentrations at levels that show a reasonable potential to exceed water quality standards.

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing.

Toxicity caused by unidentified pollutants is not expected in the effluent from this discharge as determined by the screening criteria given in Chapter 173-205 WAC. Therefore, no whole effluent toxicity testing is required in this permit. The Department may require effluent toxicity testing in the future if it receives information that toxicity may be present in this effluent.

Human Health

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health. The discharge will be re-evaluated for impacts to human health at the next permit reissuance.

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

This Permittee has no discharge to ground and therefore no limitations are required based on potential effects to ground water.

COMPARISON OF EFFLUENT LIMITS WITH THE PREVIOUS PERMIT

In addition to the Technology-Based BOD_5 and TSS limits in Table 6 below, upon issuance of the new permit the water quality limit for Ammonia will be changed as shown in Table 7 below.

Table 7. Comparison of Ammonia Limits with the Existing Permit

Parameter	Existing Permit	Proposed Permit
Ammonia	6.9 mg/L maximum daily	none

Upon completion of the POTW upgrade, the City of Zillah will send the Department a letter verifying that completion has occurred. At that time, effluent limits will be changed as shown in Table 8 below.

Table 8: Comparison of Effluent Limits with the Existing Permit Issued January 11, 2002

Parameter	Existing Permit/ Interim		Proposed Permit/ Final	
	Average Monthly	Average Weekly	Average Monthly	Average Weekly
BOD_5, in mg/L; lbs/day	30 mg/L; 78.3 lbs/day	45 mg/L; 117.5 lbs/day	30 mg/L; 123 lbs/day	45 mg/L; 184 lbs/day
TSS, in mg/L; lbs/day	30 mg/L; 78.3 lbs/day	45 mg/L; 117.5 lbs/day	30 mg/L; 123 lbs/day	45 mg/L; 184 lbs/day
Fecal Coliform Bacteria, in #colonies/100 mL	200 organisms/ 100 mL	400 organisms/ 100 mL	200 organisms/ 100 mL	400 organisms /100 mL

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Sludge monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of

Ecology's *Permit Writer's Manual* (July 1994) for an oxidation ditch with secondary clarification.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The laboratory at this facility is accredited for: Dissolved oxygen, Biological Oxygen Demand, and Total Suspended Solids tests.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit requirement S4.: to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. The amount of flow is restricted by Condition S4.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains condition S5., as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment. The proposed permit requires submission of an updated O&M manual after completion of the POTW upgrade.

INFLOW AND INFILTRATION EVALUATION

An overall evaluation of infiltration and inflow to the collection system was conducted in 1999 (Gray & Osborne 2002). Due to the age of the collection system, leaks are expected to be present. The permit will require the collection system to be evaluated again for the presence of excessive inflow and infiltration in accordance with the Environmental Protection Agency (EPA) guidelines (EPA 1985).

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in permit condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 70.95J RCW, Chapter 173-308 WAC "Biosolids Management", and Chapter 173-350 WAC "Solid Waste Handling Standards." Biosolids shall be managed in accordance with the Final Coverage granted under the Statewide General Permit for Biosolids Management.

PRETREATMENT

Federal and State Pretreatment Program Requirements

Under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986), the Department of Ecology (Department) has been delegated authority to administer the Pretreatment Program (i.e. act as the Approval Authority for oversight of delegated Publicly Owned Treatment Works (POTWs))**.** Under this delegation of authority, the Department has exercised the option of issuing wastewater discharge permits for significant industrial users discharging to POTWs which have not been delegated authority to issue wastewater discharge permits.

There are a number of functions required by the Pretreatment Program which the Department is delegating to such POTWs because they are in a better position to implement the requirements (e.g. tracking the number and general nature of industrial dischargers to the sewerage system). The requirements for a Pretreatment Program are contained in Title 40, part 403 of the Code of Federal Regulations. Under the requirements of the Pretreatment Program (40 CFR 403.8(f)(1)(iii)), the Department is required to approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) (40 CFR 403.8 (f)(1)(i)).

The Department is responsible for issuing State Waste Discharge Permits to SIUs and other industrial users of the Permittee's sewer system. Industrial dischargers must obtain these permits from the Department prior to the Permittee accepting the discharge (WAC 173-216-110(5)) (Industries discharging wastewater that is similar in character to domestic wastewater are not required to obtain a permit. Such dischargers should contact the Department to determine if a permit is required.). Industrial dischargers need to apply for a State Waste Discharge Permit sixty days prior to commencing discharge. The conditions contained in the permits will include any applicable conditions for categorical discharges, loading limitations included in contracts

with the POTW, and other conditions necessary to assure compliance with State water quality standards and biosolids standards.

The Department requires this POTW to fulfill some of the functions required for the Pretreatment Program in the NPDES permit (e.g. tracking the number and general nature of industrial dischargers to the sewage system). The POTW's NPDES permit will require that all SIUs currently discharging to the POTW be identified and notified of the requirement to apply for a wastewater discharge permit from the Department. None of the obligations imposed on the POTW relieve an industrial or commercial discharger of its primary responsibility for obtaining a wastewater discharge permit (if required), including submittal of engineering reports prior to construction or modification of facilities (40 CFR 403.12(j) and WAC 173-216-070 and WAC 173-240-110, et seq.).

Wastewater Permit Required

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

Requirements for Routine Identification and Reporting of Industrial Users

The NPDES permit requires non-delegated POTWs to " take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging to the Permittee's sewerage system". Examples of such routine measures include regular review of business tax licenses for existing businesses and review of water billing records and existing connection authorization records. System maintenance personnel can also be diligent during performance of their jobs in identifying and reporting as-yet unidentified industrial dischargers. Local newspapers, telephone directories, and word-of-mouth can also be important sources of information regarding new or existing discharges. The POTW is required to notify an industrial discharger, in writing, of its responsibilities regarding application for a State waste discharge permit and to send a copy of the written notification to the Department. The Department will then take steps to solicit a State waste discharge permit application.

Duty to Enforce Discharge Prohibitions

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass through or interference. Definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise

corrosive, or obstructive to the system. In addition wastes with excessive BOD, petroleum based oils, or which result in toxic gases, are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Support by the Department for Developing Partial Pretreatment Program by POTW

The Department has committed to providing technical and legal assistance to the Permittee in fulfilling these joint obligations, in particular assistance with developing an adequate sewer use ordinance, notification procedures, enforcement guidelines, and developing local limits and inspection procedures.

Sewer Use Ordinance Enactment

It is likely that industrial discharges have caused POTW upsets in the past. To prevent future interference problems, the Permittee is required to complete, submit, and enact a Sewer Use Ordinance.

GENERAL CONDITIONS

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued for 5 years.

REFERENCES FOR TEXT AND APPENDICES

City of Zillah 1998. City of Zillah Comprehensive Plan. Zillah, Washington.

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1985a. Infiltration/Inflow: I/I Analysis and Project Certification . Ecology Publication No. 97-03 (http://www.ecy.wa.gov/pubs/9703.pdf.)

1985b. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

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Fisher, H.B. et al. 1979. Mixing in Inland and Coastal Waters. Academic Press.
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Gray & Osborne 2002. City of Zillah, Yakima county, Washington, Wastewater Facility Plan. Gray & Osborne, Inc, Yakima, Washington.

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Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
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Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to issue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on July 6, 2006 in the Yakima Herald Republic to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on July 19, 2006 in the Yakima Herald Republic to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30 day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit. The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509/457-7105, or by writing to the address listed above.

This permit and fact sheet were written by Jean Hays**.**

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

CBOD5 – The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD5 is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into receiving water.

APPENDIX C--TECHNICAL CALCULATIONS AND DATA

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Chronic & Acute Mixing Zones using the RIVPLUM5 Model (Ecology 1996.)

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al*. (1979) with correction for the effective origin of effluent.

Revised 22-Feb-96

INPUT	chronic	acute
1. Effluent Discharge Rate (cfs):	0.38	0.51
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	3.00	3.00
Stream Velocity (fps):	0.50	0.50
Channel Width (ft):	200.00	200.00
Stream Slope (ft/ft) or Manning roughness "n":	0.029	0.029
0 if slope or 1 if Manning "n" in previous cell:	1	1
3. Discharge Distance From Nearest Shoreline (ft):	2	2
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	300	30
Distance From Nearest Shoreline (ft):	2	2
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0

OUTPUT

1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	38.10	50.70
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	#N/A	#N/A
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	0.068	0.068
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	0.046	0.046
Selected Shear Velocity for next step (ft/sec):	0.046	0.046
3. Transverse Mixing Coefficient (ft2/sec):	0.083	0.083
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.* , 1979)		
Co	1.27E-01	1.69E-01
x'	1.24E-03	1.24E-04
y'o	1.00E-02	1.00E-02
y' at point of interest	1.00E-02	1.00E-02
Solution using superposition equation (Fischer eqn 5.9)		
Term for n= -2	0.00E+00	0.00E+00
Term for n= -1	0.00E+00	0.00E+00
Term for n= 0	1.92E+00	1.45E+00
Term for n= 1	0.00E+00	0.00E+00
Term for n= 2	0.00E+00	0.00E+00
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	300.00	30.00
x' Adjusted for *Effective Origin*	1.24E-03	1.24E-04
C/Co (dimensionless)	1.54E+01	3.66E+01
Concentration at Point of Interest (Fischer Eqn 5.9)	1.95E+00	6.19E+00
Unbounded Plume Width at Point of Interest (ft)	39.864	12.606
Unbounded Plume half-width (ft)	19.932	6.303
Distance from near shore to discharge point (ft)	2.00	2.00
Distance from far shore to discharge point (ft)	198.00	198.00
Plume width bounded by shoreline (ft)	21.93	8.30
Approximate Downstream Distance to Complete Mix (ft):	94,732	94,732
Theoretical Dilution Factor at Complete Mix:	787.402	591.716
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	86.347	24.565
Calculated Dilution Factor at Point of Interest:	51.155	16.153

Dissolved Oxygen Calculations

Dissolved oxygen concentration following initial dilution.
References: EPA/600/6-85/002b and EPA/430/9-82-011

Based on Lotus File IDOD2.WK1 Revised 19-Oct-93

INPUT	chronic	acute
1. Dilution Factor at Mixing Zone Boundary:	51.2	16.2
2. Ambient Dissolved Oxygen Concentration (mg/L):	9.4	9.4
3. Effluent Dissolved Oxygen Concentration (mg/L):	4.2	4.2
4. Effluent Immediate Dissolved Oxygen Demand (mg/L):	0	0
OUTPUT		
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	9.30	9.08

Ammonia Reasonable Potential and Water Quality Calculations

Water Quality Criteria:

Calculation Of Ammonia Concentration and Criteria for fresh water. Based on EPA Quality Criteria for Water (EPA 400/5-86-001) and WAC 173-201A. Revised 1-5-94 (corrected total ammonia criterion). Revised 3/10/95 to calculate chronic criteria in accordance with EPA Memorandum from Heber to WQ Stds Coordinators dated July 30, 1992.

INPUT	
1. Ambient Temperature (deg C; 0<T<30)	20.1
2. Ambient pH (6.5<pH<9.0)	8.73
3. Acute TCAP (Salmonids present- 20; absent- 25)	20
4. Chronic TCAP (Salmonids present- 15; absent- 20)	15
OUTPUT	
1. Intermediate Calculations:	
Acute FT	1.00
Chronic FT	1.41
FPH	1.00
RATIO	14
pKa	9.40
Fraction Of Total Ammonia Present As Un-ionized	17.6880%
2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	260.0
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	42.0
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	1.5
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	0.2
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	1.2
Chronic Ammonia Criterion as N	0.19

Reasonable Potential:

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

CALCULATIONS

		State Water Quality Standard		Max concentration at edge of...											
	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Parameter	*ug/L*	*ug/L*	*ug/L*	*ug/L*	*ug/L*			*Pn*	*ug/L*	*CV*	*s*	*n*			
ammonia	14.0000	1208.0000	195.0000	294.35	102.70	NO	0.95	0.688	2400.00	0.60	0.55	8	1.90	16	51

Statistical variables for permit limit calculation				
Coeff. Var. (CV)	AML Prob'y Basis	MDL Prob'y Basis	# of Samples per Month	
decimal	decimal	decimal	*n*	
0.60	0.95	0.99	8.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00
0.60	0.95	0.99	4.00	1.00

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. Last revision date 9/98. Written by G. Shervey

Temperature calculation, critical conditions

Temperature estimate by weighted average (river flow x river temp+ effluent flow x effluent temp) divided by (river flow x river temp)

1/4 River flow, CFS	75	River ambient upper 90th percentile	20.1
max monthly eff. Flow, CFS	0.381	Effluent upper 90th percentile	24
max daily eff flow, CFS	0.507		

Ave monthly ratio

1.006066	x20.1	20.22192	
increase	0.12192		

Maximum daily ratio

1.008072	x20.1	20.26224	
increase	0.16224		

Max temp rise for class A (under 21deg C) **T=34/(T+9)**

1.168385

pH Analysis: using the average critical period effluent value..

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

INPUT	Chronic	Acute
1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	51.200	16.200
2. UPSTREAM/BACKGROUND CHARACTERISTICS		
Temperature (deg C):	20.10	20.10
pH:	8.73	8.73
Alkalinity (mg CaCO3/L):	81.00	81.00
3. EFFLUENT CHARACTERISTICS		
Temperature (deg C):	24.00	24.00
pH:	7.20	7.20
Alkalinity (mg CaCO3/L):	264.00	264.00

OUTPUT		
1. IONIZATION CONSTANTS		
Upstream/Background pKa:	6.38	6.38
Effluent pKa:	6.36	6.36
2. IONIZATION FRACTIONS		
Upstream/Background Ionization Fraction:	1.00	1.00
Effluent Ionization Fraction:	0.87	0.87
3. TOTAL INORGANIC CARBON		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	81.36	81.36
Effluent Total Inorganic Carbon (mg CaCO3/L):	301.80	301.80
4. CONDITIONS AT MIXING ZONE BOUNDARY		
Temperature (deg C):	20.18	20.34
Alkalinity (mg CaCO3/L):	84.57	92.30
Total Inorganic Carbon (mg CaCO3/L):	85.67	94.97
pKa:	6.38	6.38
pH at Mixing Zone Boundary:	8.27	7.92

DATA
Effluent data summary for the critical period:

	ALKALINITY, '	BOD, 5-DAY (:	BOD, 5-DAY	BOD, 5-DAY (2(	BOD, 5-DAY	BOD, 5-DAY PERCENT REMOVAL	COLIFORM, FEC	COLIFORM, FEC/	HARDNESS, TC	NITROGEN, AMI	OXYGEN,
	AVG	AVG	AVG	AVW	AVW	AVG	GEM	GM7	AVG	AVG	AVG
	MG/L	LBS/DAY	MG/L	LBS/DAY	MG/L	PERCENT	#/100 ML	#/100 ML	MG/L	MG/L	MG/L
	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
ZILLAH STP											
WA0020168C											
DMR (MONTHLY)											
EFFLUENT											
1											
1-Jul-02	230	14	8	30	17	98	14	48	318	0.21	4.6
1-Aug-02	230	10	5	14	8	98	8	13	496	0.08	4.6
1-Sep-02	275	14	7	32	16	98	80	173	360	0.06	3.7
1-Jul-03	265	19	11	27	15	96	40	429	301	0.86	4.3
1-Aug-03	263	17	9	20	11	97	35	360	300	0.7	4.4
1-Sep-03	249	19	10	27	14	95	6	16	302	0.72	4.3
1-Jul-04	283	7	4	13	8	98	10	40	326	1.18	5.1
1-Aug-04	242	8	5	13	8	98	11	60	319	0.29	4.5
1-Sep-04	267	12	6	35	16	98	51	64	302	0.75	4
1-Jul-05	292	9	6	29	19	98	3	11	299	1.49	4.8
1-Aug-05	265	12	8	18	11	97	3	12	314	1.45	4.4
1-Sep-05	266	8	4	17	9	98	4	30	305	1.11	4.5
Average	260.58	12.42	6.92	22.92	12.67	97.42	22.08	104.67	328.50	0.74	4.43
Max	292.00	19.00	11.00	35.00	19.00	98.00	80.00	429.00	496.00	1.49	5.10
Min	230.00	7.00	4.00	13.00	8.00	95.00	3.00	11.00	299.00	0.06	3.70

OXYGEN,	PH	PH	SOLIDS, S	SOLIDS, T	SOLIDS, T	SOLIDS, T	SOLIDS, T	TEMPERA	TEMPERATURE , WATER (DEG C)
MIN	MAX	MIN	AVG	AVG	AVG	AVW	AVW	AVG	MAX
MG/L	S.U.	S.U.	PERCENT	LBS/DAY	MG/L	LBS/DAY	MG/L	°C	°C
Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
3.9	7.5	7	96	16	9	25	14	23	25
3.5	7.3	6.8	96	15	8	30	17	22	23
2.9	7.4	6.8	94	26	13	67	34	21	23
3.8	7.7	7.3	94	20	12	35	20	23	25
3.9	7.7	7.3	93	24	13	33	17	23	24
3.5	7.8	7.3	92	27	14	42	22	21	24
4.1	7.5	7.3	98	10	6	18	11	24	26
3.9	7.7	7.4	95	19	11	39	24	24	26
3.5	8	7.3	96	22	11	43	20	21	24
4.3	7.7	7.2	96	14	9	33	22	23	25
3.1	7.8	7.3	95	16	10	32	21	23	25
3.1	8.1	7.3	96	14	8	25	13	21	23
3.63	7.68	7.19	95.08	18.58	10.33	35.17	19.58	22.42	24.42
4.30	8.10	7.40	98.00	27.00	14.00	67.00	34.00	24.00	26.00
2.90	7.30	6.80	92.00	10.00	6.00	18.00	11.00	21.00	23.00

Ambient Water Quality Data for the critical period (July-September.)

date	time	COND (umhos/cm)	FC (#/100ml)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	PRESS (mm/Hg)	SUSSOL (mg/L)	TEMP (deg C)	TP_PlnLine (mg/L)	TPN (mg/L)
7/11/1995	9:30	83	64	3940	0.022	0.172	0.02	9.9	8.3	736.6	14	14.2	0.049	0.391
8/15/1995	7:50	103	32	3410	0.016	0.13	0.019	9.2	8.3	739.6	12	16.2	0.031	0.256
9/12/1995	7:50	104	36	2900	0.014	0.132	0.022	9.1	8.1	750.6	19	15.4	0.061	0.298
7/16/1996	9:25	88	46	3780	0.01 U	0.104	0.013	8.6	7.6	729	20	16.3	0.017	0.239
8/12/1996	10:50	86	62	3640	0.01 U	0.105	0.01	9.8	8.4	739.1	11	17	0.037	0.173
9/9/1996	9:00	90	170	3200	0.01 U	0.129	0.021	9.6	8	736.6	30	14.5	0.066	0.242
7/15/1997	16:30	76		4420	0.01 U	0.124	0.024	10.8	8.7	736.6	8	18.2	0.032	0.218
8/13/1997	17:30	81	29	4060	0.01 U	1.3	0.069	10.5	8.4	739.1	25	19.9	0.122	1.51
9/16/1997	16:45	94	40	2870	0.01 U	0.178	0.017	11.2	8.4	731.5	5	12.5	0.059	0.251
7/15/1998	11:00	70	140 J	3720	0.01 U	0.141	0.023	9.6	8.1	738.4	18	15.1	0.038	0.231
8/12/1998	11:10	83	71	3120	0.01 U	0.13	0.013	9.2	8.2	732.8	20	18.6	0.022	0.249
9/9/1998	9:00	94	110 J	3010	0.01 U	0.097	0.025	9.2	8	729	18	16.3	0.071	0.235
7/7/1999	12:20	67	17	5850	0.025	0.076	0.017	10	7.8	736.6	13	15.6	0.046*	0.152
8/4/1999	12:40	71	44	3750	0.031	0.082	0.016	10	8.3	729	6	15.7	0.037*	0.196
9/8/1999	12:20	82	21	2900	0.062	0.146	0.027	11.1	8.2	731.5	16	12.2	0.071*	0.222
7/12/2000	17:15	74	31	3780	0.01 U	0.105	0.013	10.7	9.2	724.4	7	15.3	0.026*	0.2
8/16/2000	13:35	71	9	3560	0.01 U	0.103	0.016	10.19	8.21	727.71	7	17.4	0.035*	0.189
9/6/2000	12:15	88	23	2840	0.01 U	0.081	0.019	10.3	8.11	732.028	4	13.4	0.038*	0.185
7/9/2001	12:20	88	86	2680	0.017	0.137	0.024	10.07	8.46	724.916	11	20.2	0.034*	0.245
8/13/2001	13:05	77	18	2750	0.01 UJ	0.065 J	0.014 J	9.89	8.66	733.044	8 J	23.4	0.027* J	0.154 J
9/3/2001	12:10	91	28	2540	0.01 UJ	0.059 J	0.014 J	10.39	8.5	734.06	6 J	18.3	0.029* J	0.132 J
7/9/2003	14:26	118	14	3410 J	0.01 U	0.11	0.021	11.37	8.86	741.172	8	18	0.034*	0.21
8/6/2003	14:21	88	150	3770	0.01	0.128	0.019	9.94	8.32	737.362	10	19.7	0.036*	0.23
9/10/2003	13:50	96	29	2420	0.01 U	0.097	0.027	10.76	8.43	739.902	10	15.6	0.044*	0.17
7/14/2004	12:15	87	30		0.011	0.177	0.021	10	8.25	736.6	11	18	0.0293	0.271
8/4/2004	15:45	84	10		0.01 U	0.114	0.023	10.1	8.73	735.584	9	21.2	0.0279	0.19
9/15/2004	14:33	102	22		0.01 U	0.105	0.025	11.17	8.66	734.314	6	16.1	0.0361	0.2
7/13/2005	15:18	93	84	2810	0.011	0.15	0.02	10.4	8.7	742.696	9	19.6	0.0278	0.25
8/3/2005	13:55	88	10	2650	0.01 U	0.077	0.014	10.35	8.7	741.426	7	20.1	0.0236	0.16
9/14/2005	14:02	99	8	2220	0.01 U	0.051	0.023	10.81	8.79	738.632 J	9	17.8	0.0338	0.12
ave		87.2	49.44828	3333.333	0.013967	0.1535	0.020967	10.14133	8.379333	735.3282	11.9	17.06	0.043528	0.258967
min		67	8	2220	0.01	0.051	0.01	8.6	7.6	724.4	4	12.2	0.017	0.12
max		118	170	5850	0.062	1.3	0.069	11.37	9.2	750.6	30	23.4	0.122	1.51

APPENDIX D--RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.

APPENDIX E--SCHEMATIC

Schematic of planned upgrade (Gray & Osborne 2006.)